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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/077,720	02/15/2002	Yi-Nien Su	67,200-478	2638

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EXAMINER

ALANKO, ANITA KAREN

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 10/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/077,720	Applicant(s) SU ET AL.	
	Examiner Anita K Alanko	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____. | 6) <input type="checkbox"/> Other: _____ |

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu (US 6,346,474 B1) in view of Oehrlein et al (US 6,060,400).

Liu discloses a method comprising:

providing a substrate 10 having a low dielectric constant material 12 including at least one overlayer of a nitride 14 (col.3, line 8) containing material on top;

depositing a photoresist layer 16 overlying the at least one overlayer of said nitride containing material;

patterning said photoresist layer photolithographically for an etching process (Fig.1);

providing an ambient in said etch chamber conducive to forming a plasma including a hydrofluorocarbon (col.3, lines 42-44);

forming a plasma; and

whereby the at least one overlayer of said nitride containing material is preferentially etched through to a thickness to form an opening (col.3, lines 42-45).

Liu does not disclose to add nitrogen and oxygen and to control the nitrogen to oxygen ratio in the etch chamber. The etch of the nitride layer is however one that has high selectivity to silicon dioxide (col.3, line 43).

Oehrlein teaches a useful nitride etchant composition that has high selectivity to silicon dioxide. Oehrlein teaches that the etch process includes a forming a plasma with microwave power 206 and using a composition comprising fluorocarbon, nitrogen and oxygen (Fig.3). It would have been obvious to one with ordinary skill in the art to etch with a fluorocarbon, nitrogen and oxygen in the method of Liu because Oehrlein teaches that it is a useful nitride etchant composition that has high selectivity to silicon dioxide.

As to claim 2, Oehrlein also teaches that it is known to vary the amount of oxygen and nitrogen in a fluorocarbon plasma (col.4, lines 26-41). It would have been still further obvious to add oxygen to an ambient of nitrogen and fluorocarbon and adjust the nitrogen to oxygen ratio to five because the ratio appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB.

As to claims 3-4, Liu discloses that the nitride containing material comprises silicon nitride or silicon oxynitride (col.3, line 8).

As to claim 5, since the modified method of Liu has the same methods steps as the instant invention, the same result of sidewall formation is expected.

As to claim 6, examiner takes official notice that it is conventional to add additives such as hydrogen to chambers. It would have been obvious to one with ordinary skill in the art to add hydrogen in the method of Liu because it is conventional.

As to claim 7, since the modified method of Liu has the same methods step of altering oxygen as in the instant invention, the same result of adjusted bias is expected.

As to claims 8 and 19, the graphs of Oehrlein show that varying the flow rate is a result effective variable. It would have been still further obvious to vary the flow rates to those cited

because the flow rates appear to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB.

As to claims 8-9, 17-18, Ohrlein teaches that a useful pressure and microwave power are 600 mTorr and 1000 W (col.7, lines 18-20). It would have been obvious to one with ordinary skill in the art to vary the pressure to that cited because the pressure appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB.

As to claim 10, Liu does not disclose to form a dielectric layer between the nitride layer 14 and the photoresist 16. Examiner takes official notice that bilayer resists with dielectric layers such as silicon oxide are conventional. It would have been obvious to form a dielectric layer between the nitride layer and the photoresist in the method of Liu because it is a conventional technique to form patterns with bilayer resists.

Ohrlein teaches that fluorocarbon and nitrogen is a useful etchant for dielectric layers (col.4, lines 26-35). It would have been still further obvious to pattern the dielectric layer with nitrogen and a fluorocarbon because Ohrlein teaches that it is a useful etchant for dielectric layers.

The concentration of the active etching species is a result effective variable. It would have been still further obvious to adjust the fluorine to carbon ratio to two-three because the ratio appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB.

As to claims 12-13, Liu also teaches that useful dielectric layers include carbon containing materials with low dielectric constants (col.2, lines 58-65). It would have been obvious to one with ordinary skill in the art to use carbon containing materials with low

dielectric constants as the dielectric layer in the modified method of Liu because Liu teaches that they are useful dielectric layers in devices.

As to claims 14 and 16, see the rejection of claim 2.

As to claim 15, Oehrlein teaches that oxygen is also a useful etchant (col.4, lines 26-35) for dielectric layers. The concentration of the active etching species is a result effective variable. It would have been still further obvious to adjust the oxygen to that cited because the amount appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB.

As to claim 20, it would have been obvious to one with ordinary skill in the art to provide an oxygen free ambient in the method of Liu to prevent oxidation of exposed surfaces.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited art shows methods of etching nitride layers.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K Alanko whose telephone number is 703-305-7708. The examiner can normally be reached on Monday, Tuesday and Friday, 8:00 am-4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703-305-2667. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Anita K. Alanko

Anita K Alanko
Primary Examiner
Art Unit 1765